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DEPARTMENT OF THE AIR FORCE

SUPPORTING DATA FOR FISCAL YEAR 1988/89 BUDGET ESTIMATES

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DESCRIPTIVE SUMMARIES

RESEARCH, DEVELOPMENT, TEST AND EVALUATION

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FY 1988/FY 1989 RDT&E DESCRIPTIVE SUMMARY

Program Element: 12431F
 DOD Mission Area: []

Title: Defense Support Program (DSP)
 Budget: 3 - Strategic Programs

1. (U) RDT&E RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1986 Actual	FY 1987 Estimate	FY 1988 Estimate	FY 1989 Estimate	Additional to Completion	Total Estimated Cost
TOTAL FOR PROGRAM ELEMENT		65,038	113,022	103,807	95,214	Continuing	N/A
3624	DSP	65,038	113,022	103,807	72,820	Continuing	N/A
3625	DSP Follow-on []	0	0	0	22,394	Continuing	N/A

2. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: [

consists of [] satellites in geostationary orbital locations, two large processing stations, one Mobile Ground System (six Mobile Ground Terminals, six Mobile Communication Terminals, one Main Operating Base), one simplified processing station, one multi-purpose facility, and a ground communications network. []

3. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (\$ in thousands)

RDT&E	74,440	138,178	95,429	N/A	Continuing	N/A
MISSILE PROCUREMENT	124,082	358,515	445,558	N/A	Continuing	N/A
OTHER PROCUREMENT	138,649	141,312	67,356	N/A	Continuing	N/A

EXPLANATION:

- (U) FY86 RDT&E decrease of \$12.502 million due to several congressional reductions.
- (U) FY87 RDT&E decrease of \$25.156 million due to several congressional reductions.
- (U) FY88 RDT&E increase of \$8.378 million due to rephasing of the launch program.
- (U) FY86 Missile Procurement decrease of \$6.861 million due to Gramm-Rudman and general congressional reduction.
- (U) FY87 Missile Procurement decrease of \$80.378 million due to several congressional reductions.
- (U) FY88 Missile Procurement decrease of \$53.715 million due to restructuring of satellite buy and directed reductions related to inflation, profit policy and contract support.
- (U) FY87 Other Procurement decrease of \$43.493 million due to congressional reduction and reduced spares.
- (U) FY88 Other Procurement decrease of \$45.504 million due to deferral of Mobile Communication Terminal Upgrade and reduced spares.

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4. (U) OTHER APPROPRIATION FUNDS: (\$ in thousands)

	<u>FY 1986</u> <u>Actual</u>	<u>FY 1987</u> <u>Estimate</u>	<u>FY 1988</u> <u>Estimate</u>	<u>FY 1989</u> <u>Estimate</u>	<u>Additional</u> <u>to</u> <u>Completion</u>	<u>Total</u> <u>Estimated</u> <u>Cost</u>
Missile Procurement:						
Funds	117,221	278,137	391,643	488,787	Continuing	N/A
Quantities (Satellites)	0	EQQ	1	2		
Other Procurement:						
Funds	137,649	97,819	21,852	10,833	Continuing	N/A
Quantities	Not Applicable.					
Operations and Maintenance (software)	38,148	46,664	50,589	91,483	Continuing	N/A

5. RELATED ACTIVITIES: Defense Satellite Communications System (P.E. 33110F and 33605F) provides primary communications routing for DSP data [] and will help provide Mobile Ground System communications. Space Boosters (P.E. 35119F) provides Titan 34D and Titan IV launch support. Space Launch Support Program (P.E. 35171F) will provide Inertial Upper Stages and any Space Shuttle flights for DSP missions. []

Follow-on design pursued in this P.E.

[] which will be the technical basis for the DSP

6. WORK PERFORMED BY: Space Command and the Air Force Communications Command are the system operators and maintainers of the DSP ground stations. Air Force Systems Command's Space Division, Los Angeles Air Force Station, CA, has overall program management responsibility for development and acquisition. The Air Force Logistics Command, Wright-Patterson AFB, OH, provides engineering and logistics support. The Air Force Operational Test and Evaluation Center, Kirtland Air Force Base, NM, participates in test and evaluation of selected system segments. ITH, Redondo Beach, CA, is the prime contractor for the spacecraft and satellite integration. Aerojet ElectroSystems Company, Azusa, CA, is the prime contractor for the infrared sensor, and the large processing station. []

[] ITH, Boulder, CO, is the prime contractor for all software efforts as well as the prime contractor on the Mobile Ground System. The Aerospace Corporation, El Segundo, CA, furnishes general systems engineering and integration for the DSP System Program Office.

7. (U) PROJECTS LESS THAN \$10 MILLION IN FY 1988 AND/OR FY 1989: Not Applicable

488

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DOD Mission Area: []

Title: Defense Support Program (DSP)
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8. (U) PROJECT OVER \$10 MILLION IN FY 1988 AND/OR FY 1989:

(U) Project: 3624, Defense Support Program

A. Project Description: This is an operational program in which replacement satellites include evolutionary improvements for performance and survivability. These improvements have been incorporated on satellites 14 and beyond, which are designated DSP-I models. The first DSP-I will be delivered in FY 1988 and will be launched based on operational need. Projections indicate this will occur late in FY 1988 or early FY 1989. The DSP-I is dual compatible, capable of launch by either the Titan IV or the Space Shuttle. Communications survivability will be improved by a satellite-to-satellite laser crosslink [] and by mission data message rebroadcast where the satellite transmits the [] directly to the users. []

An autonomous station-keeping capability will add to satellite on-orbit endurance. Ground processing survivability has been obtained by deploying a Mobile Ground System (MGS) consisting of six Mobile Ground Terminals (MGTs), which process the raw satellite data into [] six Mobile Communication Terminals (MCTs), which provide the primary, hardened, jam resistant link to the users, and other support vehicles to sustain long-term operations in the field. The replacement of the computer peripherals in the ground stations will be continued, as well as upgrading to the operational software to make it compatible with the improved satellite capabilities. Orbital operations support, satellite maintenance and other efforts associated with maintaining a [] structure will continue.

B. (U) Program Accomplishments and Future Efforts:

(1) FY 1986 Accomplishments: Initial Operational Test and Evaluation (IOT&E) was completed on the MGS. IOT&E demonstrated that the MGS met or exceeded user requirements for [] Efforts continued to correct the areas which the tests found needing correction such as software immaturity, maintenance reliability, and logistics support. The major upgrade to make the MGT compatible with DSP-I survivability features continued. The MGT version currently deployed can support only the pre-DSP-I design. Improvements included the development of: a hybrid Mission Data Message terminal to provide a threat secure commanding and internetting capability; equipment to receive and separate the multiplexed links from two satellites; adaptive equalization equipment and improvements to the phased array antenna system [] and software to support austere commanding, autonomous ephemeris and second color processing. Similar efforts for the fixed ground stations continued. Efforts also continued to insure the dual compatibility of DSP-I satellites with both the Titan IV and the Space Shuttle.

(2) FY 1987 Program: DSP satellite []

[] The SED satellites incorporate the larger focal plane as used in the DSP-I satellites. Work will continue on making DSP satellites dual compatible. Development and procurement will continue for Mobile Ground Terminal hardware and software upgrades required for compatibility with the survivability enhancements of

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DSP-I. The Simplified Processing Station will also be made compatible with DSP-I. FY 1987 funds continue to support the Ground Communications Network upgrade which will relieve the current saturated condition and replace obsolete equipment.

(3) FY 1988 Planned Program and Basis for FY 1988 RDT&E Request: The major portion of the 1988 activity involves launch vehicle and upper stage integration to insure dual launch compatibility. This includes integration onto two launch vehicles (Shuttle and Titan IV) and two upper stages (Inertial Upper Stage and Centaur) with DSP satellites. NASA and launch site support of integration are also included. Efforts will continue on the upgrades to the Mobile Ground System to make the processing and communications hardware compatible with DSP-I. Work will continue on revising the architecture of the ground station software. This software redesign will fully complement the new capabilities of DSP-I (e.g. processing of data communicated through the laser crosslink and processing of new sensor data). The software redesign effort will make use of the DOD common programming language, Ada. This effort also includes redesign of the off-line analysis and support programs used to maintain the software. It also develops and prototypes changes in the secure satellite commanding system hardware and the spacecraft simulator to be compatible with the new DSP-I satellites. The spacecraft simulator is used to check out satellite commands before they are actually sent to the satellite. Funding also provides for general systems engineering and integration. The cost estimates were generated by the Program Office using comptroller prepared Independent Cost Estimates, contractor inputs, an OSD directed Independent Cost Analysis completed in July 1985, inputs from other government agencies and previous experience on similar modifications. Cost estimates are considered to be Category II - mature.

(4) FY 1989 Planned Program and Basis for FY 1989 RDT&E Request: Assuming that present Shuttle and Titan IV launch plans hold firm, the Air Force will launch two:

upgrades to the Mobile Ground System to make the processing and communication hardware and software compatible with DSP-I. Work will continue on revising the architecture of the ground station software. This software redesign will fully complement the new capabilities of DSP-I (e.g. processing of data communicated through the laser crosslink and off-line analysis and support programs used to maintain the software. It also completes changes in the secure satellite commanding system hardware for the Mobile Ground System to be compatible with the new DSP-I satellites. Funding also provides for general systems engineering and integration. The cost estimates are generated by the Program Office using comptroller prepared Independent Cost Estimates, contractor inputs, an OSD directed Independent Cost Analysis completed in July 1985, inputs from other government agencies and previous experience on similar modifications. These cost estimates are considered to be Category II - mature.

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DOD Mission Area: []

Title: Defense Support Program (DSP)
Budget Activity: 3 - Strategic Programs

(5) (U) Program to Completion: This is a continuing program. Primary emphasis will be directed toward eliminating or minimizing operational employment deficiencies and vulnerabilities, insuring a launch capability through the use of either the Titan IV or the Space Shuttle, the development of a survivable DSP system through the upgrades to the Mobile Ground System and satellites, and insuring the adequacy of the ground station data

C. (U) Major Milestones:

<u>Milestones</u>	<u>Dates</u>
(1) (U) Initiation of Peripheral Upgrade	August 1983
(2) []	
(3) (U) First Mobile Ground Terminal Delivery	August 1984
(4) []	
(5) []	
(6) []	
(7) (U) Satellite #14 Delivery (First DSP-I)	*(1st Qtr CY 87) 2 Quarter FY 1988
(8) (U) Successive Launches	As Required

*Date presented in FY 1987 Descriptive Summary.

(U) Explanation of Milestone Changes

(5) []
(7) (U) Delivery slipped because contractor efforts were diverted to launch attempts and satellite storage incurred by resolution of booster problems.

9. (U) PROJECT OVER \$10 MILLION IN FY 1988 AND/OR FY 1989:

Project: 3625, Defense Support Program Follow-on [] Full
Scale Development (FSD)

A. Project Description: Since 1970 the Defense Support Program has provided data for []

[] The approach has used []
[] from synchronous satellites with data processing at large, fixed ground sites. The DSP
Follow-on requirement will be met by the [] a system that will []
[] The [] program is currently under the direction of []
during the technology development. The Air Force will assume program responsibility
with the start of FSD in FY 1989. []

The decision to proceed with the [] Full Scale Development is independent from any []
The DSP Follow-on [] project will fulfill []

[] If a decision

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JOD Mission Area: []

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Budget Activity: 3 - Strategic Programs

is made [] the DSP Follow-on could be upgraded for that mission. The satellite constellation will provide a more [] system than its DSP predecessors, capable of functioning in the trans-attack and post-attack environment.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1986 Accomplishments: Not applicable.

(2) (U) FY 1987 Program: Not applicable.

(3) (U) FY 1988 Planned Program and Basis for FY 1988 RDT&E Request: Not applicable.

(4) FY 1989 Planned Program and Basis for FY 1989 RDT&E Request: FY 1989 will be the initiation of Full Scale Development (FSD) for the satellites and supporting ground stations. The program will start design efforts for two RDT&E satellites for flight in [] The Advanced Development Model which will demonstrate the technology to be employed in these two prototypes is funded by [] and is planned for [] The cost estimates were generated by the Program Office using contractor inputs, inputs from other government agencies and previous experience on similar development efforts. Cost estimates are considered to be Category IV - Planning.

(5) (U) Program To Completion: This is a continuing development effort. Primary emphasis will be directed toward eliminating or minimizing operational employment deficiencies and vulnerabilities, the development of a survivable system and insuring the adequacy of the ground stations with an efficient, but cautious transition from the DSP coverage.

C. Major Milestones:

Milestones

(1) Air Force Assumes [] FSD

1 Quarter FY 1989

10. (U) COOPERATIVE AGREEMENTS: Not applicable.

Budget Activity: 3, Strategic Programs
Program Element: 12431F, Defense Support Program (DSP)

Test and Evaluation Data

1. Development Test and Evaluation (DT&E): The Defense Support Program (DSP) was designed, developed, tested and then deployed as an operational system in the early 1970s. The system is a classified space program

[information to the National Command Authorities and military commanders for decision-making purposes. Combined Development Test and Evaluation/Initial Operational Test and Evaluation (DT&E/IOT&E) on the prototype Simplified Processing Station was completed in 1978. Over the next several years, four system upgrades will require DT&E. They are the Sensor Evolutionary Development [the Mobile Ground System; the Peripheral Upgrade Program; and the DSP-I satellite upgrades.

The Sensor Evolutionary Development satellites have more infrared detection cells in the focal plane.

[The sensor portion of the satellite is being produced by Aerojet ElectroSystems Company, [and the spacecraft is being produced and integrated by TRW, Incorporated. DT&E has been performed on one satellite at the Aerojet ElectroSystems Company and TRW facilities, [

(U) The purpose of the Mobile Ground System is to provide survivability to the Defense Support Program ground processing and communication elements through mobility. It will use the same computer hardware and software as the Simplified Processing Station. The prime contractor is IBM Corporation. DT&E was accomplished at the system level to ensure that the Mobile Ground System could meet its mobility and communication requirements prior to IOT&E start in September 1985.

(U) The Peripheral Upgrade Program (PUP) will replace all peripheral equipment at the support sites and the operational large processing stations. Replacements provide processing and display capability for the DSP-I satellite improvements and preclude equipment obsolescence and non-supportability. The PUP contract was awarded to Aerojet ElectroSystems Company in September 1983. DT&E was completed in 1986 for the CONUS Ground Station, and will be completed in 1987 for the Overseas Ground Station. The existing system must remain operational during the peripheral replacement and testing.

Budget Activity: 3, Strategic Programs
Program Element: 12431F, Defense Support Program (DSP)

DSP-I satellites include several survivability upgrades: a satellite-to-satellite crosslink capability to reduce overseas ground station and communication vulnerability, [a mission data message rebroadcast capability to reduce communication vulnerability, and an autonomous ephemeris capability to allow the satellite to remain operational without regular updates from fixed ground stations. Development of these satellites started in late fiscal year 1981. The first will be delivered in 1983. The DT&E program for these upgrades will be similar to that on the Sensor Evolutionary Development System, including DT&E of the satellite, ground station hardware and software modifications.

2. (U) Operational Test and Evaluation (OT&E):

Mobile Ground System (MGS). The Air Force Operational Test and Evaluation Center (AFOTEC) IOT&E of the DSP Mobile Ground System (MGS) started on 30 September 1985 and was completed on 31 March 1986. Testing was supported by Air Force Systems Command (AFSC) (Space Division), Air Force Communications Command (AFCC), Air Force Space Command (AFSPACECOM), and the [command centers. MGS IOT&E was conducted at the Main Operating Base (MOB). [

MGS was deployed from three to 14 days up to 300 miles from the MOB. During deployments, test team members accompanied the MGS in order to obtain firsthand knowledge of system's capabilities and limitations under realistic tactical field conditions. Additionally the MGS was deployed to [] For field tests, the [] for a 14 day period.

(U) An MGS convoy consists of two prime elements: a Mobile Ground Terminal (MGT); and a Mobile Communications Terminal (MCT). While deployed, MGSs are supported by crew messing, crew quarters, field maintenance, fuel tanker, and two security police vehicles. The MCTs employed in the IOT&E and now deployed operationally are termed Limited Communications Vehicles (LCVs), as they do not fully meet MGS mobility, hardening or survivability requirements. Funds were cut which were to procure fully capable MCTs in FY88. The LCV consists of an Army-developed Low-Bandwidth Secure Communications Terminal (LBSCT) mounted on an MGT transportation subsystem. The MGS was operated and maintained during IOT&E by Air Force personnel supplied by AFSPACECOM and AFSC.

The MGS convoys demonstrated the capability to operate with a high degree of mission success while deployed to distances of several hundred miles from the MOB. [

Budget Activity: 3, Strategic Programs
Program Element: 12431F, Defense Support Program (DSP)

Operational suitability was marginal due to poor mission reliability, inadequate logistics supportability, lack of hardness maintenance/surveillance program, and lack of software maturity. The deficiencies are being corrected via service reports and subsequent corrective actions. None of these prevented the MGS from being used operationally by AFSPACECOM.

Sensor Evolutionary Development (SED). Testing is in progress for the Air Force Space Command (AFSPACECOM)-conducted, Air Force Operational Test and Evaluation Center (AFOTEC)-monitored IOT&E of SED satellite 6R and associated ground station software upgrades. Original time frame for SED IOT&E was April 1985 through November 1986. However, the delay in launching satellite 5R has resulted in this testing being put on hold. Interim reports exist for testing at the CONUS Ground Station (CGS) and Mobile Ground System (MGS). The primary purpose of this IOT&E is to ensure that the SED meets the current operational mission capability without any degradation to the DSP. To bring the SED technology on line as soon as possible, IOT&E at the [was divided into Above-the-Horizon (ATH) and Below-the-Horizon (BTH) sections. The SED CGS BTH IOT&E, completed May 1985; SED CGS ATH IOT&E completed April 1986; and SED MGS BTH completed March 1986 concluded that SED provided a satisfactory replacement for existing DSP assets. The remaining phases of IOT&E will be conducted at the Overseas Ground Station (OGS), and the Simplified Processing Station (SPS).

(U) Peripheral Upgrade Program (PUP). A three-phase test program is in progress for the Air Force (AFSPACECOM)-conducted, Air Force (AFOTEC)-monitored IOT&E of the DSP Peripheral Upgrade Program. Each phase corresponds to testing at the multipurpose facility (MPF), CGS and OGS. Testing is scheduled for January 1986 through June 1987. The MPF testing, completed in March 1986, surfaced minor software problems which were being fixed when the second phase was being started. The CGS phase started when one of the three computer strings was tested from April to May 1986. The software for the second string was loaded and IOT&E began in June 1986, with expected completion in December 1986. Expected completion of third string testing is mid-March 1987. OGS installation and testing will be completed by September 1987.

Survivable Defense Support Program Satellites (DSP-I). Test planning is in progress for the AFOTEC-conducted IOT&E of the survivable Defense Support Program (DSP-I). The DSP-I is a new generation satellite designed to increase satellite survivability and reduce dependence on fixed ground resources. Main elements to be tested in support of enhanced survivability for DSP are the Mobile Ground System and the Laser Crosslink Subsystem. Testing is now being keyed to the [The test program is based on the conduct of a combined DT&E/IOT&E phase followed with a dedicated IOT&E test phase at the operational sites. The IOT&E phases will include survivability studies, DT&E monitoring, early on-orbit testing, DT&E/IOT&E testing and site IOT&E.

Budget Activity: 3, Strategic Programs
Program Element: 12431F, Defense Support Program (DSP)

(U) Ground Communications Network (GCN) Upgrade. The GCN upgrade is a multiphase project forecast for FY85-89. The GCN port expansion project was initiated to increase the number of high speed user data ports and add Advanced Data Communications Control Procedures (ADCCP) message protocol capability. This IOT&E is being conducted by SPACECOM and monitored by AFOTEC. The port expansion IOT&E was performed March through December 1985. Another phase of the GCN upgrade is the communication subsystem data entry display program. This phase will replace the old Sigma computers at the Data Distribution Center with two new computers which will function as a computer manager to distribute data to low speed users and from low speed sources. This also replaces the old user terminals with current technology terminals.

(U) OT&E Reports Published:

(U) Sensor Revolutionary Development (SRD) for Large Processing Station (LPS), Simplified Processing Station (SPS), and Mobile Ground System (MGS) IOT&E Plan, November 1984, (S), HQ AFSPACECOM/XPW.

(U) Survivable Defense Support Program (DSP-I) IOT&E Plan, December 1984, (S), HQ AFOTEC/TES.

(U) SRD CONUS Ground Station (CGS) Below-the-Horizon (BTH) IOT&E Interim Test Report, May 1985, (S), HQ AFSPACECOM/XPW.

(U) SRD CGS Above-the-Horizon (ATH) IOT&E Interim Test Report, April 1986, (S), HQ AFSPACECOM/XPW.

(U) Mobile Ground System (MGS) IOT&E Plan, September 1985, (S), HQ AFOTEC/TES.

(U) Mobile Ground System (MGS) IOT&E Final Report, June 1986, (S), HQ AFOTEC/TES.

(U) SRD MGS BTH IOT&E Interim Test Report, November 1986, (S), HQ AFSPACECOM/XPW.

Budget Activity: 3, Strategic Programs
Program Element: 12431P, Defense Support Program (DSP)

3. (U) System Characteristics:

<u>Characteristics</u>	<u>Objectives</u>	<u>Demonstrated</u>
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<u>Current Operational System</u>		
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<u>Sensor Evolutionary Development and Advanced Atmospheric Burst Locator Improvements</u>		
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(U) DSP-I Improvements

Satellite-to-satellite crosslink
Mission data message rebroadcast
capability
Two color focal plane
Autonomous ephemeris

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4. (U) Current Test and Evaluation (T&E):

<u>Event</u>	<u>T&E Activity (Past 12 Months)</u>		<u>Remarks</u>
	<u>Planned Activity</u>	<u>Actual Date</u>	
(U) DSP-I IOT&E	Dec 84 - Sep 86	Dec 84 - Oct 86	Survivability studies and analysis phase of DSP-I testing.
(U) Mobile Ground System (MGS) IOT&E	Sep 85 - Feb 86	Sep 85 - Mar 86	
(U) Sensor Evolutionary Development (SED) OORUS Ground Station (OGS) Above-the-Horizon (ATH)	3 Jan - 31 Jan 86	3 Jan - 31 Jan 86	Above the horizon portion of phase I SED testing.
(U) SED MGS Below-the-Horizon (BTH)	Sep 85 - Feb 86	Sep 85 - Mar 86	
(U) Peripheral Upgrade Program (FUP) IOT&E Phase I Multipurpose Facility (MPF)	Dec 85 - Jan 86	Jan 86 - Mar 86	MGS Phase of SED IOT&E conducted during MGS IOT&E
(U) FUP IOT&E Phase II OGS	Apr 86 - Nov 86	Apr 86 - 2nd Qtr FY87	

<u>Event</u>	<u>T&E Activity (Next 12 Months)</u>		<u>Remarks</u>
	<u>Planned Date</u>		
(U) Test and Evaluation Master Plan (TEMP) Approval	Jan 87		Three 30 day test periods. IOT&E performed at OGS and OGS. Dates are dependent on launch of satellite 5A. 30-day test at all locations at the same time.
(U) FUP IOT&E Phase II Overseas Ground Station (OGS)	Mar 87 - Sep 87		
(U) SS-14 IOT&E	Jan 87 - Feb 88		
(U) SED Simplified Processing Station (SPS) IOT&E	4th Qtr FY87		
(U) GCS Upgrade IOT&E	Sep 87		